

Patent Claims

1. A navy vessel type equipment system for electrically propelled navy vessels of various sizes and propulsion power, in which the navy vessels, for example frigates, corvettes, high-speed patrol boats, unmanned attack boats or supply vessels (equipment system vessels) have standard equipment segments for propulsion and vessel operation and wherein the individual navy vessel types have vessel hulls which are designed on a type-dependent basis, that is to say on a size and task-specific basis, while the equipment segments for propulsion, such as electrical steering propellers and waterjets and vessel operation including power generation, power distribution and automation are designed independently of the type and can be combined depending on the propulsion power and object of the individual navy vessels, wherein the equipment segments are designed such that they can be installed in a prefabricated manner at different locations in the vessel hull.

2. The navy vessel type equipment system as claimed in claim 1, characterized in that in comparison to their power, the equipment segments comprise small and light propulsion equipment segments which have electric motors using high-temperature superconducting (HTS) technology, in particular motors which have rotor windings that are cooled directly or indirectly by liquid neon or liquid nitrogen.

3. The navy vessel type equipment system as claimed in claim 1 or 2, characterized in that in comparison to their power, the equipment segments have small and light power generation units which are designed as internal

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combustion engine generator sets on standard
foundations.

4. The navy vessel type equipment system as claimed in claim 3,

characterized in that the internal combustion engine generator sets are provided with generators using HTS technology, which, in particular, have windings which are cooled directly or indirectly with liquid neon or liquid nitrogen.

5. The navy vessel type equipment system as claimed in claim 2, 3 or 4,

characterized in that the motors and generators are designed to be shock-resistant with outer and inner shock damping.

6. The navy vessel type equipment system as claimed in claim 5,

characterized in that the motors and generators are installed elastically, in particular on standard foundations and in addition have a stator/rotor system which is elastically connected to the machine housing and can move independently of the housing, that is to say forms a unit which can move independently in the housing and has its own shock damping elements.

7. The navy vessel type equipment system as claimed in claim 1, 2, 3, 4, 5 or 6

characterized in that the stators of the motors and generators have air-gap windings.

8. The navy vessel type equipment system as claimed in one of more of the preceding claims,

characterized in that the vessel hulls have a pipeline system for liquid nitrogen or for liquid neon, to which HTS components can be connected, such as motors, generators and possibly current limiters, in particular via quick-release couplings.

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9. The navy vessel type equipment system as claimed in one or more of the preceding claims, characterized in that at least one air decomposition unit for the production of liquid nitrogen is arranged in the vessel hull and is connected via pipelines to the individual HTS components in the vessel hull.

10. The navy vessel type equipment system as claimed in one or more of the preceding claims, characterized in that the individual equipment system type vessels have electrical power generation units which operate with low emissions and can be installed in a decentralized manner.

11. The navy vessel type equipment system as claimed in claim 10, characterized in that the individual equipment system vessels have internal combustion engines whose exhaust gas is introduced into the water surrounding the vessel hulls.

12. The navy vessel type equipment system as claimed in one or more of the preceding claims, characterized in that the type vessels have power supply units which operate without any emissions, in particular in the form of air-breathing fuel cells, which preferably feed their power to a DC network.

13. The navy vessel type equipment system as claimed in claim 12, characterized in that the fuel cells are in the form of PEM fuel cells.

14. The navy vessel type equipment system as claimed in claim 12,
characterized in that the fuel cells are in the form of methanol direct fuel cells (MDFC) or molten carbonate
5 fuel cells (MCFC).

15. The navy vessel type equipment system as claimed in claim 12, 13 or 14,
characterized in that the PEM and the MDFC or MCFC fuel
10 cells, possibly as well as other fuel cells with a higher operating temperature than the PEM fuel cells, form a power and heat system in which they produce power as required, corresponding to their different dynamics.

15 16. The navy vessel type equipment system as claimed in claim 12, 13 or 15,
characterized in that the fuel cells are supplied from hydrogen reservoirs which are filled by diesel
20 reformers.

17. The navy vessel type equipment system as claimed in one or more of claims 12 to 16,
characterized in that the exhaust gases which are
25 produced by the operation of the MDFC or MDFC and/or the diesel reformers are mixed with the water surrounding the vessel hulls.

18. The navy vessel type equipment system as claimed
30 in one or more of the preceding claims,
characterized in that the equipment system vessels are designed without rudder blades.

19. The navy vessel type equipment system as claimed in claim 18,
characterized in that the equipment system vessels have steering propellers and/or lateral thrusters.

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20. The navy vessel type equipment system as claimed in claim 18 or 19,
characterized in that the equipment system vessels have waterjets which can be controlled independently of one
10 another, in particular waterjets arranged in pairs, which can change the heading of the vessels.

21. The navy vessel type equipment system as claimed in one of more of the preceding claims,
15 characterized in that the equipment system vessels have AC and DC network elements for connection of the individual power generation and load units.

22. The navy vessel type equipment system as claimed
20 in claim 21, characterized in that converters which connect the network elements to one another are arranged between the network elements.

23. The navy vessel type equipment system as claimed
25 in claim 21 or 22, characterized in that the electrical network system is designed such that it has DC network elements with different voltages and/or AC network elements with
30 different frequencies and voltages.

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24. The navy vessel type equipment system as claimed in claim 21 or 22,
characterized in that a DC network which is equipped with an HTS current limiter is provided between the
5 fuel cells and the electrical steering propellers.

25. The navy vessel type equipment system as claimed in claim 21, 22, 23 or 24,
characterized in that the on-board network is
10 subdivided into network elements which are connected to one another and whose connections have HTS current limiters and/or high-speed semiconductor switches.

26. The navy vessel type equipment system as claimed
15 in claim 25,
characterized in that high-speed semiconductor switches are arranged in the on-board network, by means of which individual network elements or individual equipment segments can be quickly switched in the event of a hit
20 on the supply network to a supply by parts of the supply network which are not affected by the hit, such that no electrical damage occurs to the components or equipment segments.

27. The navy vessel type equipment system as claimed
25 in claim 21, 22, 23, 24, 25 or 26,
characterized in that a higher-frequency network element, for example a network element at up to 400 Hz, is arranged between the generator, which in particular
30 is driven by a gas turbine, for the waterjets.

28. The navy vessel type equipment system as claimed in one or more of the preceding claims,
characterized in that the equipment system type vessels
35 have an automation system which has an automation control center which is

connected to the individual vessel areas via a bus system which, in particular, is a redundant bus system, in particular via glass-fiber buses.

5 29. The navy vessel type equipment system as claimed in claim 28,
characterized in that the bus system accesses a segmented network wherein the bus preferably has a redundant design and connects the segmented network in
10 the individual vessel protection areas to the automation control center.

30. The navy vessel type equipment system as claimed in claim 28 or 29,
15 characterized in that the automation control center automatically makes system-controlled decisions when urgent measures for vessel protection require this.

31. The navy vessel type equipment system as claimed
20 in claim 28, 29 or 30,
characterized in that the automation control center has an expert system which is in the form of a higher level for automation and which allows all the measured values to be indicated, and allows the system statistics and
25 the circuit constellations to be displayed in a comprehensive, clear form with decision proposals.

32. The navy vessel type equipment system as claimed in claim 29, 30 and 31,
30 characterized in that the equipment system vessels have a life cycle management system and a status monitoring system for controlling the logistics for the equipment system vessels.

33. The navy vessel type equipment system as claimed in one or more of claims 28 to 32, characterized in that the navy vessel type equipment system has a battle damage control system which is
5 incorporated in the automation systems and allows all of the internal areas and their states to be displayed on at least one monitor.

34. A vessel type equipment system for electrically
10 propelled vessels of various sizes and propulsion power,
characterized in that the equipment segments for propulsion and vessel operation and the components connected to them are designed in particular as claimed
15 in one or more of claims 1 to 32 such that they can be used for merchant navy vessels, for coastal defense boats, for customs boats etc. and for sea-going yachts.